New claims

1. A method for correcting the phase difference between the pixel clock of a graphics card and the sampling clock of a flat-panel display with an analog interface in a system comprising flat-panel display, graphics card and computer, characterized in that automatic adjustment of the phase difference is performed repeatedly.

2. A method according to claim 1, characterized in that the automatic adjustment of the phase difference is performed continuously.

3. A method according to claim 1, characterized in that the automatic adjustment of the phase difference is performed periodically.

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4. A method according to one of claims 1 to 3, characterized in that the phase-difference adjustment necessary for the instantaneous condition of the system is determined only at individual image spots, and in that the determined phase-difference adjustment is then applied to the entire image.

5. A method according to claim 4, characterized in that a sufficiently bright image spot is selected and the rising edge of a video pulse of this image spot is determined, in that a sufficiently bright image spot is selected and the rising edge of a video pulse of this image spot is determined, and in that the phase difference is adjusted such that the sampling instant for the entire image is situated approximately at the midpoint between the rising and falling edges of the video pulse.

6. A method according to claim 4, characterized in that the rising edge of a video pulse of a sufficiently bright image

spot is determined, and in that the phase difference is adjusted such that the sampling instant is shifted by approximately half the width of an image spot toward the center of the pixel.

7. A method according to claim 4, characterized in that the falling edge of the video pulse is determined at a sufficiently bright image spot, and in that the phase difference is adjusted such that the sampling instant is shifted by approximately half the width of an image spot toward the center of the pixel.

8. A method according to one of claims 5 to 7, wherein the image area and image spots are arrayed on the flat-panel display in rows and columns between a back-porch region and a front-porch region, characterized in that an image spot in the first image column close to the back-porch region is chosen as the sufficiently bright image spot for determination of the rising edge and an image spot in the first image column close to the front-porch region is chosen as the sufficiently bright image spot for determination of the falling edge.

9. A method according to one of claims 5 to 8, characterized in that the brightness of a plurality of image spots of the first or last image column is measured, and the image spots with the greatest brightness in the first or last image column are chosen for determination of the rising or falling edge respectively of the video pulse.

10. A method according to one of claims 5 to 8, characterized in that the image spots (n x k) are first measured with n = 1, 2, ... N and k = constant, such as 10, and in that, if no sufficiently bright image spot was found, the image spots (n + m) x k are measured with m = 1, 2, ... N, until a sufficiently bright image spot is found.

11. A method according to one of claims 5 to 8, characterized in that, for determination of the amplitude values of the selected image spots, the phase differences at these image spots are shifted until the measured amplitude values no longer change significantly, and in that the amplitude values then determined are further processed.

12. A method according to one of claims 5 to 8, characterized in that the phase difference used for determination of the amplitude values is advanced sufficiently that the measured amplitude values are smaller than a predetermined limit value, for example smaller than 50% of the amplitude value, in that the phase difference is delayed by half the width of a spot, and in that the amplitude value then measured is further processed.

13. A method according to one of claims 5 to 8, characterized in that, for determination of the rising edge of the selected image spots, the phase difference at the selected image spot is shifted sufficiently toward the back-porch region that the measured amplitude value is reduced to a predetermined percentage, for example 50%, of the previously determined amplitude value, and in that this value of the phase difference is stored temporarily as the position of the rising edge.

14. A method according to one of claims 5 to 8, characterized in that, for determination of the falling edge of the selected image spots, the phase difference at the selected image spot is shifted sufficiently toward the front-porch region that the measured amplitude value is reduced to a predetermined percentage, for example 50%, of the previously determined amplitude value, and in that this value of the phase difference is stored temporarily as the position of the falling edge.

15. A method according to one of claims 5 to 8, characterized in that the phase difference or sampling instant is delayed relative to the midpoint between the rising and falling edges by a predetermined amount, for example 10% of the width of the image spot.

16. A method according to one of the preceding claims, characterized in that the pixel or pixels that is or are influenced or distorted by matching is or are masked by distortion-free image fragments from a video memory.

17. A method according to claim 15, characterized in that the video memory is repeatedly regenerated, preferably with every second image.

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18. A method according to one of claims 4 to 17, characterized in that the sampling instant can be changed by the user compared with the value determined during matching, in which case an offset adjusted in this way is taken into consideration during automatic matching.

19. A device for correcting the phase difference between the pixel clock of a graphics card and the sampling clock of a flat-panel display with an analog interface in a system comprising flat-panel display, graphics card and computer, characterized by a device by which automatic adjustment of the phase difference is performed repeatedly.

20. A device according to claim 19, characterized by a device by which automatic adjustment of the phase difference is performed continuously or periodically.

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21. A device according to claim 19 or 20, characterized by

an adjusting device for shifting the phase difference, comprising a circuit containing two PLL circuits (PLL1, PLL2), whose outputs (A1, A2) can be adjusted independently of one another as regards their phase difference.

22. A device according to claim 19 or 20, characterized by an adjusting device for shifting the phase difference, comprising a PLL circuit (PLL) with two clock outputs (A1, A2), whose output clock signals can be adjusted independently of one another as regards their phase difference.

23. A device according to claim 22, characterized in that the two outputs (A1, A2) of the PLL circuit (PLL) optionally deliver a sampling clock signal for matching and a sampling signal for the entire image.

24. A device according to claim 23, characterized in that the sampling clock is delivered alternately by the two outputs of the PLL circuit.

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25. A device according to one of claims 19 to 25, characterized by a device by which the phase-difference adjustment necessary for the instantaneous condition of the system is determined only at individual image spots, and by which the determined phase-difference adjustment is then applied to the entire image.

26. A device according to one of claims 19 to 25, characterized by a device which determines the rising edge of a video pulse of a sufficiently bright image spot, by a device that determines the falling edge of the video pulse at a sufficiently bright image spot, and by an adjusting device with which the phase difference is adjusted such that the sampling instant is located at approximately the midpoint between the

rising and the falling edges of a video pulse.

27. A device according to one of claims 19 to 26, characterized by a device which determines the rising edge of a video pulse of a sufficiently bright image spot, and by an adjusting device with which the phase difference is adjusted such that the sampling instant is shifted by approximately approximately half the width of an image spot toward the center of the pixel.

28. A device according to one of claims 19 to 26, characterized by a device which determines the falling edge of a video pulse at a sufficiently bright image spot, and by an adjusting device with which the phase difference is adjusted such that the sampling instant is shifted by approximately approximately half the width of an image spot toward the center of the pixel.

29. A device according to one of claims 26 to 28, characterized by a PLL circuit which is programmed such that it oscillates at an integral multiple of the needed sampling frequency, and by a downstream frequency divider, which divides the sampling frequency of the PLL circuit by a factor n, wherein n sampling signals phase-shifted by 1/n periods relative to one another can be generated.

30. A device according to claim 29, characterized in that the factor n = 2 is used and, when the phase difference of the PLL circuit is adjusted such that the one sampling signal is in phase with one edge of the pixel, the other sampling signal is shifted by 1/2 pixel in its phase difference.

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31. A device according to one of claims 19 to 26, characterized by a device for shifting the phase difference

for determination of the sampling value of the image spot until the measured amplitude values no longer differ significantly, whereupon the sampling value determined then is further processed.

32. A device according to one of claims 19 to 26, characterized by a device which advances the phase difference used for determination of the sampling value sufficiently that the measured amplitude values are smaller than a predetermined limit value, such as smaller than 50% of the sampling value, and by a device which then retards the phase difference by half the width of an image spot, whereupon the sampling value measured then is further processed.

33. A device according to one of claims 19 to 26, characterized by a device which shifts the phase difference for determination of the rising edge sufficiently far toward the back-porch region that the measured amplitude value decreases to a predetermined percentage, such as 50% of the previously determined amplitude value, whereupon this value of the phase difference is stored temporarily as the position of the rising edge.

34. A device according to one of claims 19 to 26, characterized by a device which shifts the phase difference for determination of the falling edge sufficiently far toward the front-porch region that the measured amplitude value decreases to a predetermined percentage, such as 50% of the previously determined amplitude value, whereupon this value of the phase difference is stored temporarily as the position of the falling edge.

35. A device according to one of claims 19 to 34, characterized by an adjusting device, by which the sampling

instant can be changed by the user compared with the value determined during matching, in which case an offset adjusted in this way is taken into consideration during automatic matching.